Centers for Disease Control and Prevention

"It's a Small World": Infection Prevention in the Global Context

Katie Wilson, MPH
Epidemiologist, International Infection Control Program
Division of Healthcare Quality Promotion

Passport to Prevention (APIC)

September 20, 2019

Learning Objectives

- Identify infection prevention issues from recent outbreaks in low- and middle-income countries
- Differentiate outbreak IPC and health system strengthening IPC
- Describe lessons learned from implementing infection prevention and control (IPC) in resource-limited health systems

DHQP's International Infection Control Program

- Established 2015
- Multi-disciplinary group
  - Physicians, nurses, epidemiologists, microbiologists, program specialists

What We Do

Improve Infection Prevention and Control Capacity

IICP facilitates and strengthens capacity for implementation and evaluation of infection control programs and surveillance systems for healthcare-associated infections (HAI)

Reduce the Global Burden of Drug Resistance

IICP assists countries in developing national antimicrobial resistance action plans and prevention programs as well as establishing laboratory-based surveillance systems

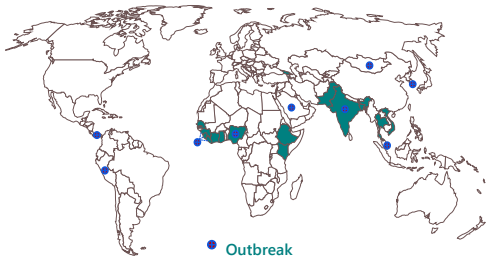
Rapidly Respond to Outbreaks

IICP rapidly deploys scientists around the globe to investigate and control healthcare-related outbreaks

Core Areas

- Policy
- Surveillance
  - Laboratory
  - Epidemiology
- Infection control
- Stewardship

Where We Work



IPC Challenges

- Administrative
  - IPC sometimes not seen as a priority
- Staff/ personnel
  - Limited staff and budget
  - Few IPC specialists
- Infrastructure
  - Sanitation, equipment, PPE
  - Hospital design and overcrowding
- Knowledge/ behavior
  - Training, mentorship, supervision

Drivers, dynamics, and control of emerging vector-borne zoonotic diseases: *The Lancet 380:9857, 1-7 Dec 2012, pp. 1946-55.*
www.sciencedirect.com/science/article/pii/S0140673612611519

May 2018	Nigeria-Lassa fever
October 2017	Madagascar-pneumonic plague
July 2017	Fiji-multi-drug-resistant *Acinetobacter baumannii*
March 2017	Panama-*Candida auris*
August 2016	Peru-symmetric gangrene
July 2016	Mongolia-Measles
June 2016	India-Colistin-resistant *Klebsiella pneumoniae*
October 2015	Singapore-Hepatitis C virus
September 2015	Saudi Arabia-Middle East Respiratory Syndrome (MERS)
June 2015	Republic of Korea-Middle East Respiratory Syndrome (MERS)
2014-2016	Sierra Leone, Liberia, and Guinea-Ebola

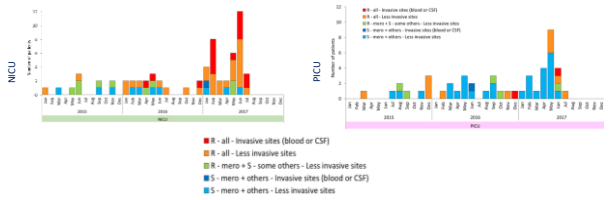
MDR *Acinetobacter baumanni*, Fiji

Background

- Hospital in Fiji identified 12 pediatric ICU patients with multidrug-resistant *A. baumannii* isolated in blood or cerebrospinal fluid samples between December 2016 and June 2017, all of whom died.
- Referral center for central division of Fiji
  - 550-850 births/month
  - 2,000 inpatient admissions/month
  - Only NICU in the region (30 beds)

Case finding

- Reviewed pediatric MDRO log to identify all specimen positive for *A. baumannii* between Jan 2015–July 2017
- Identified 173 *A. baumannii* isolates from 127 patients



Case-patients

	All case-patients n=34	Invasive case-patients n=14	Less-invasive case-patients n=20
Ethnicity			
Fijian	29 (85%)	10 (71%)	19 (95%)
Indian	5 (15%)	4 (29%)	1 (5%)
Age*			
< 2 months	31 (91%)	13 (93%)	18 (90%)
>6 months	3 (9%)	1 (7%)	2 (10%)
Microbiology Results			
First cultures collected positive for AB investigation strain	3 (9%)	0 (0%)	3 (15%)
First AB positive specimen collected on day of ICU admission	2 (6%)	0 (0%)	2 (10%)
Multiple specimen positive for AB investigation strain	19 (56%)	12 (85%)	7 (35%)
Risk factors/Exposures			
Ventilation before positive culture	33 (97%)	14 (100%)	19 (95%)
PPV/ventilation within 24 hours of admission	29 (85%)	13 (93%)	16 (80%)
Central line before culture positive	27 (79%)	13 (93%)	14 (70%)
IV phlebitis before culture positive	4 (12%)	1 (7%)	3 (15%)
Inotropes	22 (65%)	9 (64%)	13 (65%)
TPN before culture positive	8 (24%)	4 (29%)	4 (20%)
Blood transfusion before culture positive	28 (82%)	14 (100%)	14 (70%)
Treatment			
Treated with Meropenem	23 (68%)	11 (79%)	12 (60%)
Treated with Colistin	12 (35%)	7 (50%)	5 (25%)
Outcomes			
Death	23 (68%)	12 (86%)	11 (55%)

Infection control practices

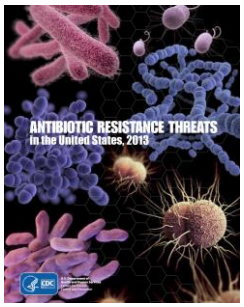
- Multi-access of sterile solutions
  - IV medications
  - IV solutions
- Poor IV therapy administration and practices
- Inappropriate antiseptic and disinfectant agents
- Unsafe disposal of sharps
- Inability to verify sterility of equipment and consumables processed by hospital sterile services
- Lack of planned maintenance for all equipment
- Overcrowding

Lessons Learned

- Complex problems require complex solutions
  - Infrastructure, processes, training, mentorship, policies, etc.
- Focus on priorities with higher risk (as a first step)
- Capacity building is a marathon, not a sprint

AR Threat Report

- **Updated AR Threats Report late 2019**
  - Update to 2013 report
  - More data, more guidance



https://www.cdc.gov/drugresistance/biggest_threats.html

Ebola, Democratic Republic of the Congo (DRC)

Ebola Background

- Ebola is found in several African countries
- First discovered in 1976 near the Ebola River in what is now the Democratic Republic of the Congo
- Outbreaks have appeared sporadically in East, Central, and West Africa
- Believed that Ebola is zoonotic and that bats are the most likely source

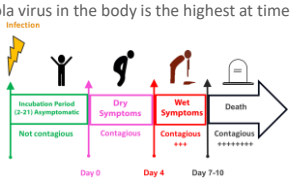
Human to Human Transmission

- Ebola virus can be found in all body fluids:
  - **Blood**
  - **Feces/Vomit**
  - **Urine**
  - **Tears**
  - **Saliva**
  - **Breast milk**
  - **Amniotic fluid**
  - **Vaginal Secretions**
  - **Sweat**
  - **Semen**

- Contact (through a break in skin, mouth, eyes) with the body fluids of a person that is sick or has died of EVD

Progression of EVD

- Not contagious until symptoms develop
- Wet symptoms develop ~Day 4 of illness
- Patient becomes more and more contagious as illness advances
- Amount of Ebola virus in the body is the highest at time of death



Treatment

- No FDA approved treatments for EVD
- Early supportive care alone can significantly improve chances of survival
- 4 experimental treatments approved for use in DRC through a randomized clinical control trial

Name of Drug	Type of Drug
ZMapp	Triple monoclonal antibody cocktail
Regeneron	Triple monoclonal antibody cocktail
mAb 114	Monoclonal antibody
Remdesivir	Antiviral

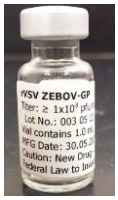
Treatment Update

Independent Monitoring Board Recommends Early Termination of Ebola Therapeutics Trial in DRC Because of Favorable Results with Two of Four Candidates

- August 2019: Independent Data and Safety Monitoring Board (DSMB) recommended study be stopped and all future patients randomized to receive either EGN-EB3 or mAb114
- Preliminary results (n=499) indicate individuals receiving REGN-EB3 or mAb114 had greater chance of survival

rVSV-ZEBOV-GP Ebola Virus Vaccine

- Live vaccine containing a piece of Ebola virus
- Experimental
- Given as single dose
- Protects only against Ebola virus (species *Zaire ebolavirus)*



Ebola Vaccine Use in DRC

- Vaccine offered to:
  - Contacts and contacts of contacts of EVD cases through a ring vaccination strategy
  - Frontline healthcare workers
- Eligibility criteria:
  - Children >6 months of age
  - Adults, including pregnant and lactating women

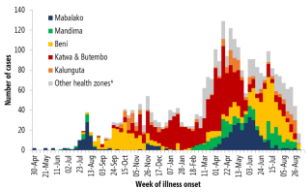
Overview of Ebola Outbreak in DRC

- August 1, 2018, DRC Ministry of Health confirmed an Ebola outbreak in eastern DRC (*species Zaire ebolavirus)*
  - Different from Equateur Province outbreak (May – July 2018)
- Occurring in highly insecure environment with armed conflict
  - Complicates response activities

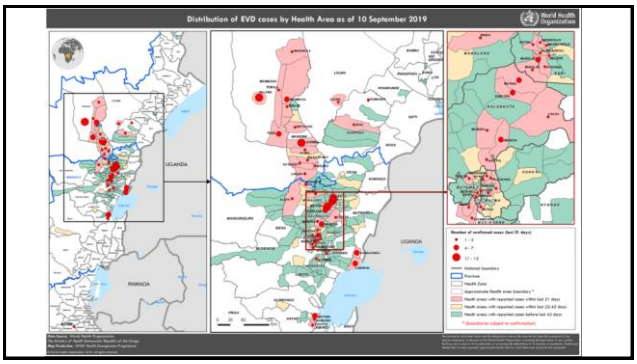
Surrendering to the Big Picture: Historical and Legal Perspectives on Accountability in the Democratic Republic of Congo Following the Defeat of the March 23 Movement - Scientific Figure on ResearchGate. Available from: https://www.researchgate.net/figure/Map-of-the-DRC-with-North-and-South-Kivu-provinces-in-red-Source-www_fig1_260299693 [accessed 17 Sep, 2019]

Quick Stats

- As of September 18, 2019:
  - 3,150 total cases (3,039 confirmed and 111 probable cases)
  - 2,074 total deaths (67% overall case fatality ratio)
  - 159 health worker infections (5% of all cases)



Source: World Health Organization Disease Outbreak News, Ebola, September 12, 2019



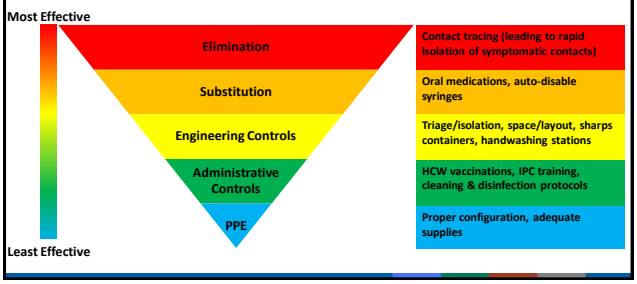
Response challenges

- Complex humanitarian emergency
  - >1 million internally displaced persons in DRC
  - Continuous movement of refugees to neighboring countries, including Uganda, Rwanda, and South Sudan
- Incidents of violence against response teams & community mistrust
- High number of EVD deaths occurring outside of an Ebola treatment unit
- Low number of confirmed cases under surveillance at the time of notification

IPC Lessons Learned from West Africa

- IPC is about human capacity, not just PPE and supplies
- Extremely challenging to rapidly create IPC where there previously was none
- A culture of safety needs to be fostered across healthcare system
  - Integration into long-term IPC programs (national staff for IPC)

Hierarchy of Controls and Ebola



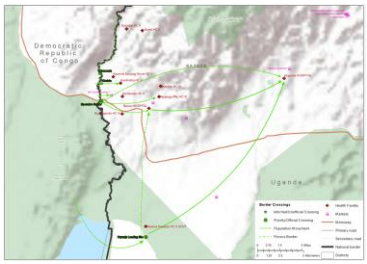
IPC Priorities

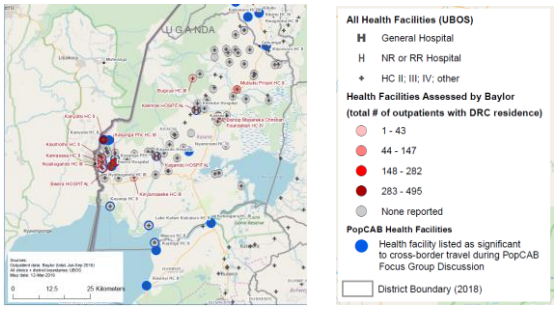
- Immediate priority: **Triage, Isolation, Referral**
- Longer-term priority: infrastructure and system improvements
- Focus is on settings/structures where healthcare is delivered
  - Some IPC principles can be applied, with modification, to prevent transmission in community settings [**community hygiene**]

IPC Challenges

- Coordination and communication
- Inconsistent messaging
- Extremely poor infrastructure at healthcare facilities
- Barriers to implementing triage and isolation:
  - Administrative support
  - Staff shortages
  - Accountability
  - Motivation
  - Risk perception
  - Staff fatigue
  - Compensation

Tools: Population Mobility Mapping





KAP Survey of Healthcare Workers, June 2019

REPUBLIQUE DEMOCRATIQUE DU CONGO
MINISTERE DE LA SANTE

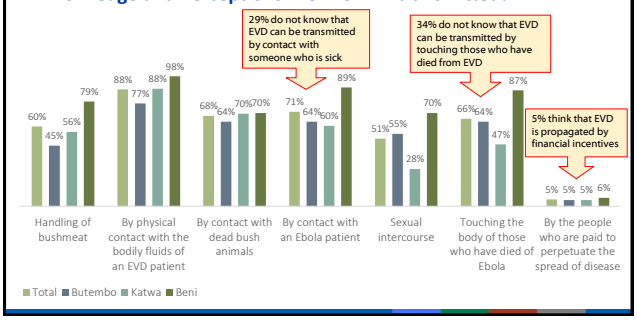
unicef

Organisation mondiale de la Santé

CDC
Centers for Disease Control and Prevention

AFRICA CDC
Centres for Disease Control and Prevention
Safeguarding Africa's Health

Knowledge and Perceptions: How is EVD transmitted?



CDC Ebola Resources

https://www.cdc.gov/vhf/ebola/index.html

Get in touch:
Email: kwilson8@cdc.gov
LinkedIn: Katie Wilson (CDC)

https://www.cdc.gov/infectioncontrol/index.html

For more information, contact CDC
1-800-CDC-INFO (232-4636)
TTY: 1-888-232-6348 www.cdc.gov

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.